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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/728,517	12/05/2003	Sang-Yong Kim	8836-203 (IE12204-US)	9036

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EXAMINER	
THOMAS, TONIAE M	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 09/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/728,517	KIM ET AL.	
	Examiner	Art Unit	
	Toniae M. Thomas	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6, 11-34, 39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *1,2,4-6 and 25-34* is/are allowed.

6)☒ Claim(s) *11-13,16,18,19 and 39* is/are rejected.

7)☒ Claim(s) *14,15,17 and 20-24* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *08/18/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This Office action is in response to the after-final amendment filed on 30 June 2006.

2. Currently, claims 1, 2, 4-6, 11-34, and 39 are pending.

Allowable Withdrawn

3. The indicated allowability of claim 3 is withdrawn in view of the newly discovered reference to Stols (US 6,200,942 B1). Rejections based on the newly cited reference follow.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. *Claim 39 is rejected under 35 U.S.C. 102(b) as being anticipated by Stols (US 6,200,942 B1).*

Stols discloses a method for cleaning metal layers, wherein the method comprises: cleaning metal layers with a cleaning solution, the cleaning solution comprising an acid solution, an oxidation agent containing iodine, and water (col. 1, lines 50-57).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. *Claims 11-13, 16, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitano (US 5,665,646) in view of Stols (US 6,200,942 B1).*

Kitano discloses a method of forming a silicide layer, which includes selectively removing a metal layer (see figs. 8-11 and accompanying text). The method comprises: forming a silicon pattern 31, 33 over a substrate 21 (fig. 8 and col. 3, lines 41-54); forming a metal layer 47 over the substrate (fig. 10; col. 4, lines 5-9; and col. 4, line 66 - col. 5, line 1); performing a silicide thermal treatment to form a metal silicide layer from silicidation reaction between the silicon and the metal layer (fig. 11 and col. 5, lines 1-18); and cleaning a non-reacting metal layer that does not participate in the silicidation reaction using a cleaning solution (col. 5, lines 19-21).

The metal layer includes titanium (col. 4, line 66 - col. 5, line 5).

The silicide thermal treatment comprises: performing a first thermal treatment (col. 5, lines 1-18); performing a first cleaning that removes a non-reacting metal layer using the cleaning solution (col. 5, lines 19-21); and performing a second thermal treatment (col. 5, lines 22-26).

As discussed above, Kitano discloses cleaning a non-reacting metal layer that does not participate in the silicidation reaction using a cleaning solution, wherein the cleaning solution comprises an ammonium hydrogen peroxide solution (col. 5, lines 19-21). While Kitano discloses cleaning the non-reacting metal layer using a cleaning solution, Kitano does not teach that the cleaning solution includes an acid solution and an oxidation agent containing iodine, and further includes water.

As explained above with respect to claim 39, Stols discloses a method for cleaning metals, wherein the cleaning solution comprises an acid solution, an oxidation agent containing iodine, and water (col. 1, lines 50-57).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify Kitano by cleaning the non-reacting metal layer, using a cleaning solution comprising an acid solution, an iodine-containing oxidation agent, and water, as taught by Stols, because the cleaning solution has particular application to metals (Stols - col. 1, lines 61-65).

Kitano does not teach that the cleaning is performed at a temperature range of about room temperature to about 120°C, as recited in claim 16. However, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to perform the cleaning at a temperature range of about room temperature to about 120°C, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art (*In re Aller*,

105 USPQ 233). In addition, while Stols teaches that the cleaning solution may comprise iodine in amount of 0.003 to 10wt %, Stols does not teach that the cleaning solution includes water in an amount of about 30 wt% and less (col. 1, lines 56-57). However, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to provide the cleaning solution such that the wt% of water is about 30 wt% and less, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art (*In re Aller*, 105 USPQ 233).

Allowable Subject Matter

6. Claims 14, 15, 17, and 20-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. Claims 1, 2, and 4-6 are allowable over the prior art of record. The prior art of record does not anticipate, teach or suggest a method of selectively removing metal layers using a cleaning solution comprising an acid solution, water, and an iodine-containing oxidation agent selected from the group consisting of NH_4IO_3, $LiIO_3$, $CaIO_3$, $BaIO_3$, KI, and NH_4I.

8. Claims 25-34 are allowable over the prior art of record. The prior art of record does not anticipate, teach or suggest a method of selectively removing a metal layer in a process for forming a silicide layer, wherein the method comprises performing a cleaning that removes both a titanium nitride layer and

a non-reacting metal layer using a cleaning solution comprising an acid solution, an iodine-containing oxidation agent, and water.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toniae M. Thomas whose telephone number is (571) 272-1846. The examiner can normally be reached on Monday through Friday from 8:30 a.m. to 5:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TMT
19 September 2006

Michael Trinh
Primary Examiner
Act SPE